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# Some Predictors of Constructivist Teaching in Elementary Education

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## Abstract

*The aim of this research is to examine the extent to which certain sociodemographic characteristics of students and teachers, along with computer self-efficacy, attitudes towards the new media and the frequency of using the new media in instruction, can be regarded as predictors of constructivist teaching. The research was carried out on a sample of a group (N=1528) of eighth-grade students (n=1026) and class and subject teachers (n=502) in primary and lower secondary school (ISCED level 1 and 2). Data was collected through survey questionnaires with relevant instruments. The results show that, in terms of students, their sociodemographic characteristics, a higher level of computer self-efficacy, more positive attitudes towards new media and more frequent use of new media, as separate factors, are significant predictors of constructivist learning. In terms of teachers, their attitudes and computer self-efficacy are significant, but their sociodemographic characteristics and the use of new media are not. The entire final series, both in terms of teachers and students, is a significant predictor of constructivist learning, where certain separate dimensions of predictor factors are more significant than others. The greatest variance of constructivist teaching, both in terms of students and teachers, can be explained by the attitude towards new media and computer self-efficacy rather than the use of new media in instruction, as confirmed by some previous theoretical assumptions. Although significant correlations were obtained, the results point to an occasional organisation of constructivist teaching. The possible reasons and implications of such results are explained in this paper.*

**Key words:** attitudes toward computer; computer self-efficacy; constructivism; new media; primary school.

## **Introduction**

Today's generations of young people are referred to as digital natives or the net-generation (Prensky, 2001; Tapscott, 1999) as they were born into a digital, multimedia environment where they own and make the best use (Rideout, Foehr, & Roberts, 2010), even before they enter formal education, of the computer, the internet, mobile phones, tablets and social networks (Ito et al., 2010). Therefore, such students need student-centred instruction, but which would also include the use of the new media (Schaumburg, 2003; Schaumburg & Issing, 2002). In this respect, there is also talk of a new culture of learning (Rodek, 2011; Simons, van der Linden, & Duff, 2002) and its main feature: a step away from the didactics of teaching to the didactics of learning. The role of new media is always observed in the context of the dominant theories of learning and didactic models (Stadtfeld, 2004). Over the last couple of decades, constructivist learning has become more prominent (Tobias & Duffy, 2009), and consequently, also the use of new media in such teaching (Kanselaar et al., 2002; Schaumburg, 2003). After the initial euphoria in the second half of the last century and optimistic expectations that information-communication technologies would change and revolutionise education and teaching, it has turned out that the effect of media in teaching is on a decline (Kulik & Kulik, 1991; Tamim et al., 2011; Timmerman & Kruepke, 2007). Therefore, recent studies show that new media in itself is not significant for the quality of teaching. Didactic arrangements that also include new media would be the most significant factor that affects the quality of teaching (Dillon & Gabbard, 1998; Tamim et al., 2011). This would include project-based learning, play-based learning, inquiry-based learning, problem-based learning, cooperative learning, and learning by doing (Kommer, 2001). The foundation for such forms of learning is constructivist learning. For such teaching, and primarily the use of new media, the decision to organize it is significant in itself (Rodek, 2011). This decision is based on motivation, the ability to use new media and attitudes towards new media.

## **Constructivist Learning**

Constructivism is a philosophical, psychological and didactic theory (Kanselaar et al., 2002). In the 20th century, didactic and psychological theory developed significantly under the influence of Dewey, Piaget, Bruner, Vygotsky, Watzlawick, and others (Fosnot & Perry, 2005; von Glasersfeld, 2003; Tobias & Duffy, 2009). As a psychological and didactic theory of learning, constructivism means that all knowledge is individually constructed in interaction with one's environment. It can be defined as a self-regulated and interpretative process of building up knowledge through an active relationship with the environment (Fosnot & Perry, 2005, p. 34). Therefore, constructivist didactics refers to such features of teaching where students know what they study, they are provided with control over the learning process, they are enabled to take part in various activities, their former experiences and emotions are acknowledged, they are engaged through dialogue, and life-like situations are

facilitated (Pritchard & Woolard, 2010, p. 48). One could establish that constructivist learning includes didactic arrangements of project-based learning, inquiry-based learning, problem-based learning, cooperative learning, play-based learning and learning by doing. Such didactic elements were already visible in the movements and directions of reform pedagogy (Skiera, 2009). On the other hand, the new media, along with its functional abilities, and in particular in terms of the current Web 2.0 technology, is viewed as a strong contributor to constructivist learning (e.g. Schaumburg, 2003; Rosen & Salomon, 2007). New media enables situational and cooperative learning, creativity-oriented learning, individualisation and problem-based learning (Kanselaar et al., 2002; Schulz-Zander & Tulodziecki, 2009). Therefore, new media re-affirms the didactic elements of the directions and movements of reform pedagogy (Kommer, 2001).

For constructivist teaching with new media, it is significant that it acknowledges interaction between the individual characteristics of the students and teachers and various forms of teaching (Leutner, 1993). Cooperation between the students and teachers and the role of an explanation, especially for the development of intuitive knowledge (Swaak, van Joolingen, & de Jong, 1998), a superior level of pre-knowledge and more positive attitudes towards learning (Lee & Chen, 2009), and the use of multimedia software that enables the application of intuitive understanding and reflexion (Reid, Zhang, & Chen, 2003) are significant. Constructivist learning encourages what is referred to as conceptual change (Zacharia & Anderson, 2003) and critical thinking (Bošnjak, 2009), but it is not appropriate to value it with teacher-centred instruction instruments (Rosen & Salomon, 2007). Teachers who prefer student-centred instruction also use new media more frequently (Friedrich & Hron, 2010; Overby et al., 2010).

## **Computer Self-Efficacy**

The concept of computer self-efficacy follows from Bandura's theory of self-efficacy (Bandura, 1977). In the mid-1980s, it began to be widely used in explanations related to using information-communication technology (Murphy, Coover, & Owen, 1989; Hill, Smith, & Mann, 1987). Computer self-efficacy can be defined as an assessment of one's own abilities for using information-communication technology for achieving the desired goal (Murphy et al., 1989; Whitley, 1997). For optimum use of information-communication technology, the way in which people assess their computer self-efficacy has proved to be important, i.e., those who expressed a low level of computer self-efficacy largely avoided using this technology (Sam, Othman, & Nordin, 2005; Whitley, 1997). In other words, they were unmotivated to use information-communication technology, which is significant for using new media in teaching (Rodek, 2011). This is also confirmed by the theoretical concept of self-regulated learning and motivation where self-efficacy is one of the elements of motivation (Pintrich & de Groot, 1990).

A higher level of computer self-efficacy is connected with the decision to use a computer (Hill et al., 1987; Teo & Ling Koh, 2005), a lower level of anxiety towards

the computer, more successful use of the computer (Brosnan, 1998) and a higher level of pre-knowledge (Potosky, 2002). In addition, it was shown that younger generations estimate a higher level of computer self-efficacy than older ones (Whitley, 1997). More frequent and demanding previous use of new media is connected with a higher level of computer self-efficacy, which is in turn connected with a lower level of exhaustion and work burnout (Salanova et al., 2000), although Deng, Dool, and Troung (2004) claim that computer self-efficacy is not determined by prior use of new media, but by intrinsic motivation, autonomous activity and self-regulated learning. Johnson (2005) points to a connection between the use of computer programmes, teaching goals and the individual characteristics of teachers with computer self-efficacy, and that motivation for using the computer, among other things, is one of the significant factors in achieving the desired goals.

## **Attitudes toward New Media**

Considerable development of information-communication technology in the 1970s resulted in research of self-confidence in using, and attitudes towards the computer (Roussos, 2007). The first research on attitudes towards the computer date back to that time. Attitudes can be defined as predisposed positive or negative relationships towards an object, person, institution or event (Ajzen, 2005), i.e., an emotional reaction towards someone or something (Gardner, Disenza, & Dukes, 1993). In that respect, attitudes towards the computer are actually an emotional reaction (Gardner, Disenza, & Dukes, 1993), i.e., a positive or negative attitude towards the computer manifests itself through feelings, abilities, intentions and usefulness of using the computer (Smalley, Graff, & Sounders, 2001). One could talk about attitudes, beliefs and the intention of use (Roussos, 2007). Frequently, attitudes towards the computer were the subject of research along with anxiety towards the computer and computer self-efficacy (Harrison & Kelly Rainer, 1992; Nash, 1997; Woodrow, 1991). Nash (1997) claims that self-confidence and anxiety are two opposing ends of a continuum of relationship towards the computer. Woodrow (1991) compared four initial instruments and obtained significant matches in terms of liking, anxiety and the social and educational role/usefulness of the computer. Selwyn (1999) holds that the affective experience, usefulness, control of using and the intention of using the computer are dimensions of attitudes towards new media. Teo (2008), and Larbi-Apau and Moseley (2012) accept such a model of attitudes towards the computer. It is significant that attitudes, together with some other factors, such as anxiety, the ability to use, self-efficacy and the mechanisms of motivation are significant for the decision to use and apply new media in various working and social situations.

Attitudes towards the computer are connected with the subject matter and the manner of teaching (Larbi-Apau & Moseley, 2012; Selwyn, 1999), access to the computer at home, but there is no difference in attitudes towards the computer in terms of gender, type of school and class (Selwyn, 1999). More positive attitudes

towards the computer are connected with frequent use of the computer (Kutlaca, 2011), better quality use of the computer, organisation of teaching (Larbi-Apau & Moseley, 2012; Shapka & Ferrari, 2001) and more positive attitudes towards their usefulness in teaching, but that their use in teaching is determined by the skills of using them (Yushau, 2006).

As shown in the theoretical and comparative analysis and the results of empirical research of the problem, it is observed that the role of new media in teaching varies based on competence- and motivation-related factors. The research shown in this paper was conducted based on all of the above points.

## Method

The aim of this research was to examine the extent to which certain sociodemographic characteristics, along with computer self-efficacy, attitudes towards the new media and the frequency of using new media in teaching, could be regarded as predictors of constructivist teaching. The authors also wanted to identify possible differences in all of the mentioned factors between students and teachers.

## Sample

The research was carried out on a sample ( $N=1528$ ) of groups of eighth-grade students ( $n=1026$ ) and class and subject teachers ( $n=502$ ) in primary and lower secondary school (ISCED level 1 and 2) (twenty schools from all regions of the Republic of Croatia). The research included 491 boys (47.9%) and 535 girls (52.1%), of whom 719 (70.1%) live in towns, and 307 (29.9%) in more rural areas. There were 74 (14.7%) male and 428 (85.3%) female teachers, of whom 330 (65.7%) work in towns, and 159 (31.7%) work in rural areas, 182 (36.5%) work in the first four grades, and 317 (63.1%) in the subject-based last four grades, and 2 (0.4%) are extended stay teachers. A total of 290 (57.8%) teachers completed teacher studies (pedagogy/teacher academy/faculty of teacher education), 171 (34.1%) teachers completed teacher training as part of some other studies, and 41 (8.2%) teachers completed some other studies followed up by education in pedagogy/psychology. In relation to the teachers' years of service, the lowest was one year, and the highest was 44 years, with an average of 15 years.

## Instruments

Data was collected by means of adopting (with the permission of all authors) and back translating the translated instruments, i.e., the *Computer Self-efficacy Scale* (Teo & Ling Koh, 2010), the *Computer Attitude Scale* (Selwyn, 1999) and the *Constructivist Learning Environment Scale* (Taylor, Fraser, & Fischer, 1997). The frequency of using new media related to the computer, the internet, mobile phones, multimedia software, tablet computers, smartphones and social networks, and this was recorded on a five point scale (1= *never* to 6 = *every day*).

The *Computer Self-efficacy Scale* (Teo & Ling Koh, 2010) is made up of three latent factors and twelve manifest items. Each item was measured on a five-point Likert

scale (from 1 = *strongly disagree* to 5 = *fully agree*). The instrument was constructed in such a way that it was de-contextualised with regard to any individual digital device, and in terms of content applicable to both subsamples. The *Basic Computer Skills* factor relates to the ability to use the computer, such as making PPT presentations, using basic programs and the like, and contains five manifest statements. The second factor, *Media-Related Skills*, targets the skills of using specific programs, such as editing, and specialised software etc., and contains four manifest statements. The *Web-Based Skills* factor is aimed at the ability to use the internet and internet applications and contains three manifest statements. The reliability of the scales that are significant was examined and it showed that the instrument was reliable: Basic Computer Skills ( $\alpha=.88$ ); Media-Related Skills ( $\alpha=.87$ ) and Web-Based Skills ( $\alpha=.75$ ). The appropriateness of the scale was also confirmed by factor intercorrelation: the Basic Computer Skills factor with the Media-Related Skills factor ( $r=.515$ ;  $p<.01$ ) and with the Web-Based Skills factor ( $r=.503$ ;  $p<.01$ ), and the Media-Related Skills factor with the Web-Based Skills factor ( $r=.758$ ;  $p<.01$ ).

The *Computer Attitude Scale* (Selwyn, 1999) is a 21-item instrument with four factors of computer attitudes assessed on a 5-point Likert scale (ranging from 1 = *strongly disagree* to 5 = *strongly agree*). The scale was initially constructed for computer attitudes, so a semantic modification of statements was used to change the term “computer” to the term “new media”. The first factor, *Affective*, consists of six items that measured values attributed to new media. The second factor, *Perceived Usefulness*, consists of five items that measured the extent to which new media are believed to be useful. The third factor, *Perceived Control*, consists of six items that measured the perceived personal control of working with new media. The fourth factor, *Behavioural Intent*, consists of four items that focused on the purpose of using new media. The Cronbach Alpha test shows satisfactory reliability: Affective ( $\alpha=.67$ ), Perceived Usefulness ( $\alpha=.70$ ), Perceived Control ( $\alpha=.66$ ) and Behavioural Intent ( $\alpha=.56$ ). Factor correlations are significant, which further shows the appropriateness of using this instrument: Affective with Perceived Usefulness ( $r=.303$ ;  $p<.01$ ), with Perceived Control ( $r=.457$ ;  $p<.01$ ) and with Behavioural Intent ( $r=.438$ ;  $p<.01$ ); Perceived Usefulness with Perceived Control ( $r=.45$ ;  $p<.01$ ), with Behavioural Intent ( $r=.38$ ;  $p<.01$ ); and Perceived Control with Behavioural Intent ( $r=.358$ ;  $p<.01$ ).

The *Constructivist Learning Environment Scale* (Taylor et al., 1997) was developed to examine the characteristics and frequency of constructivist learning. There are five factors to the instruments, and thirty-five items on a 5-point Likert scale (from 1 = *never* to 5 = *almost always*), where each of the mentioned latent factors includes seven manifest statements. The *Personal Relevance* factor is aimed at an assessment of the perceived importance of learning. The *New Media Uncertainty* factor was initially developed to deal with uncertainties in mathematics, but it was semantically adapted to relate to new media, and directed towards the rapid changeability and relativity of new media. The *Critical Voice* factor focuses on the assessment of the critical voice towards knowledge, multitude of perspectives and selection of information. The *Perceived Control* factor focuses on the planning and organisation of learning and self-regulation of learning. The *Student Negotiation* factor means partner learning, and

arrangements and negotiations concerning the organisation of the activity of learning. Factor correlations are significant, which further shows the appropriateness of using the scale: Personal Relevance with New Media Uncertainty ( $r=.519$ ;  $p<.01$ ), with Critical Voice ( $r=.505$ ;  $p<.01$ ), with Perceived Control ( $r=.252$ ;  $p<.01$ ) and with Student Negotiation ( $r=.565$ ;  $p<.01$ ); New Media Uncertainty with Critical Voice ( $r=.51$ ;  $p<.01$ ), with Perceived Control ( $r=.439$ ;  $p<.01$ ) and with Student Negotiation ( $r=.453$ ;  $p<.01$ ); Critical Voice with Perceived Control ( $r=.416$ ;  $p<.01$ ) and with Student Negotiation ( $r=.499$ ;  $p<.01$ ); and Perceived Control with Student Negotiation ( $r=.499$ ,  $p<.01$ ).

### Procedure

The research covered the span of one year, from the beginning of 2013 to the beginning of 2014. First, consent was obtained from all schools, followed by the written consent of parents/guardians on the participation of their children in the research. The participants filled out a questionnaire using the paper and pen method. Research participation was voluntary and anonymous.

### Results

The results show that almost all students and teachers own a computer, have access to the internet, and own a mobile phone (over 95%) to the same extent, while to a lesser extent they own some multimedia software (around 80%). Over 90% of the students have a profile on one of the social networks, while only half of the teachers have one. To a significantly lesser extent they own tablet computers and smartphones, where in both cases the students own such media to a greater extent than teachers (Figure 1).

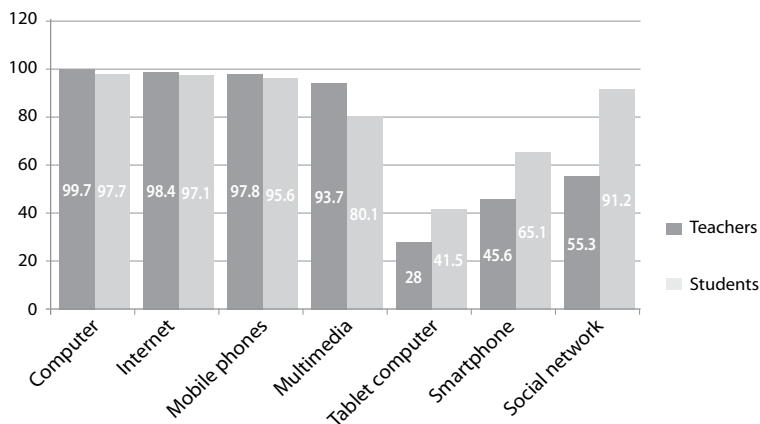


Figure 1. Frequency of possessing new media: students and teachers

The teachers and the students estimate the frequency of using new media in the classroom differently. From 15% to 35% of the students estimate that they use the computer, the internet and a mobile phone once a week, several times a week or every day, while 10-20% of them assess that they never use such media, that they use them once a month or 2-3 times a month, and once or several times a week. They use



multimedia software less frequently, i.e., almost 40% of the students never use such multimedia software, while up to 15% use such medium once a month up to every day. In general, one could say that the smartphone is rarely present in instruction, as around 45% never use it. Other categories of the frequency of use account for up to 10%. About a third of the students use social networks during instruction every day, and around 25% never use them, around 10% use them once a month, 2-3 times a month, and once or several times a week (Figure 2).

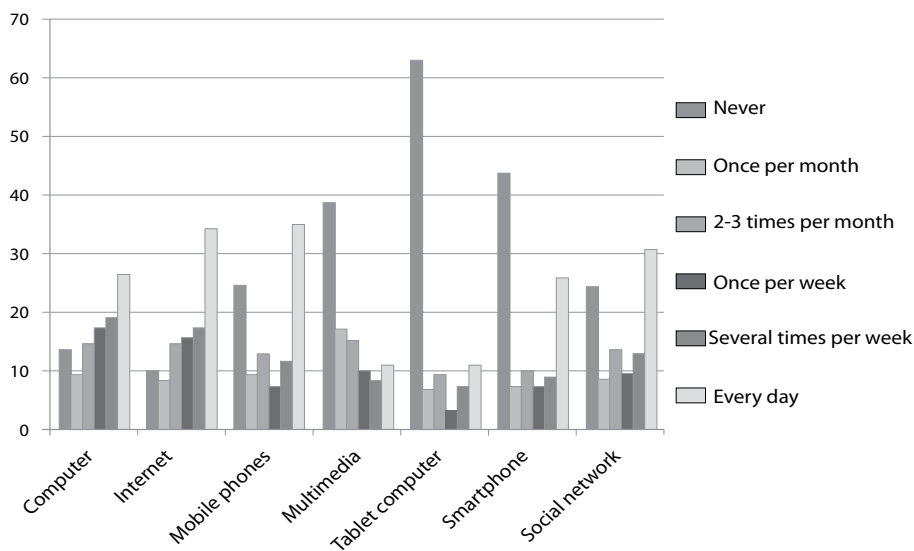


Figure 2. Frequency of using new media in the classroom: students

Further, teachers estimate the frequency of using the computer and the internet in the classroom at about the same rate, i.e., only around 20% of them use it once a week or several times a week, while 25-35% use it every day. Twenty-five percent of them never use the mobile phone, while 35% use it every day, and around 10% use it from once a month to several times a week. It was shown that teachers use multimedia software in the classroom extremely rarely, i.e., up to 20% use it across all categories of frequency. From 65 to 85% of teachers never use tablet computers, smartphones and social networks, while other categories of frequency account for up to 5% (Figure 3).

Analyses of the differences by applying the Mann-Whitney U test (Table 1) show that teachers assess their Basic Computer Skills in computer self-efficacy higher than students, but the difference is small. A different result was obtained in terms of Media-Related Skills and Web-Based Skills, where the students show a higher level of self-efficacy than teachers, while the difference in both cases is medium. It should be pointed out that, in general, students assess their Media-Related Skills as just above average, while teachers assess them as average. In terms of the difference in attitudes, teachers show a more positive standpoint in their Affective experience of the media



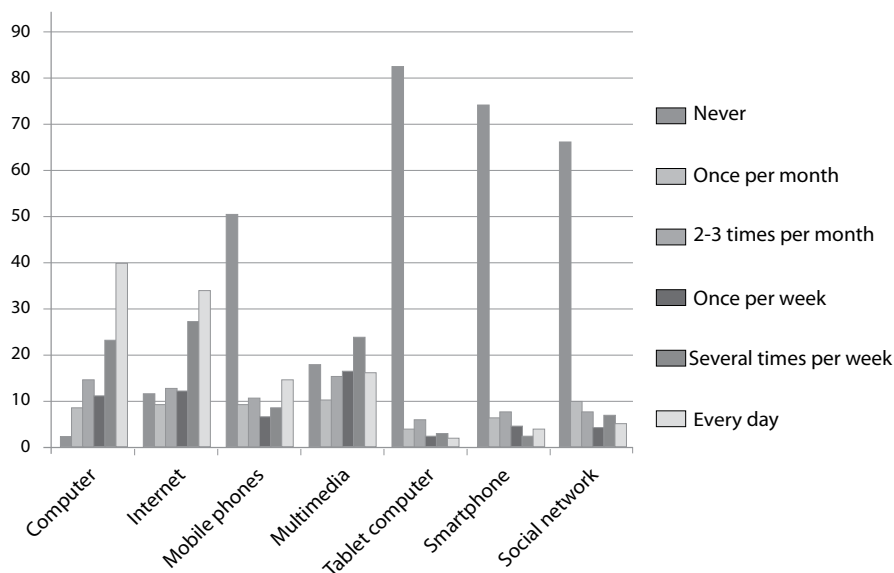


Figure 3. Frequency of using new media in the classroom: teachers

than the students, although the difference is small, and in the Perceived Usefulness and Behavioural Intent, where the difference is medium. Furthermore, both students and teachers assess their attitudes towards Perceived Control of new media in the same way. It is clear that, in general, teachers show a positive attitude that is slightly above average, while students have an indecisive attitude.

Table 1

Differences in certain factors between the students and teachers

Factors	Students (N=1026)			Teachers (N=502)			U	Z	ES <sub>i</sub>
	M	Md	SD	M	Md	SD			
CSE – Basic Computer Skills	4.21	4.6	.92	4.37	4.6	.81	238496.0*	-2.39	.06
CSE – Media-Related Skills	3.45	3.5	1.07	2.55	2.5	1.11	144998.5**	-13.92	.36
CSE – Web-based Skills	3.56	3.7	1.02	2.77	2.7	1.21	162302.5**	-11.8	.30
CAS – Affective	3.59	3.5	.77	3.87	3.8	.81	204870.5**	-6.49	.16
CAS – Perceived Usefulness	3.30	3.2	.79	3.88	4	.69	148245.5**	-13.52	.34
CAS – Perceived Control	3.51	3.5	.73	3.55	3.5	.78	245885.5	-1.37	.03
CAS – Behavioural Intent	3.33	3.6	.78	4.03	4.3	.84	140671.5**	-14.49	.37
CLES – Personal Relevance	3.26	3.3	.62	3.78	3.7	.49	133528.5**	-15.29	.39
CLES–New Media Uncertainty	3.29	3.3	.76	3.56	3.6	.59	200029.5**	-7.11	.18
CLES – Critical Voice	3.30	3.3	.64	3.68	3.7	.44	162531.5**	-11.76	.30
CLES – Perceived Control	2.87	2.9	.81	3.44	3.4	.58	145896.5**	-13.8	.35
CLES – Student Negotiation	3.05	3	.67	3.60	3.6	.50	132973.0**	-15.4	.39

$p < .05^*$ ;  $p < .01^{**}$

The predictor role of sociodemographic characteristics, computer self-efficacy, attitudes towards new media and the frequency of using new media in the explanation of constructivist teaching is analysed via a four-step hierarchical regression analysis. Intercorrelations of the tested variables were statistically significant for the subsample of students and teachers (Tables 2 and 3). This order of factors in the analysis is based on the theoretical grounds that computer self-efficacy is connected with attitudes towards new media, while attitudes can be predictors of the decision to use media in the classroom. The theory of media didactics also points to this order that for the use and effect of the media in instruction the decision itself is significant (motivation, attitudes, self-efficacy, etc.) (Rodek, 2011, p. 20), but also so are the meta-analyses of the relationship between attitudes and later conduct (e.g., Glasman & Albarrcin, 2006).

Table 2

*Intercorrelations of tested variables for the subsample of students*

	School	Grade	CSE-BCS	CSE-MRS	CSE-WBS	CAS-AC	CAS-PU	CAS-PC	CAS-BI	CLES-PR	CLES-NU	CLES-CV	CLES-SC	CLES-SN	CLES
Gender	-.022	.183**	.005	-.057	-.015	-.012	.056	.044	.018	.031	-.021	.107**	-.020	-.004	.019
School		-.176**	-.075*	-.116**	-.160**	.070*	-.006	-.049	-.008	-.159**	-.044	-.131**	.177**	-.142**	-.077*
Grade			.245**	.121**	.114**	.084**	.145**	.166**	.100**	.149**	.112**	.180**	.048	.139**	.171**
CSE-BCS				.594**	.544**	.222**	.273**	.402**	.167**	.169**	.272**	.236**	.168**	.145**	.284**
CSE-MRS					.711**	.050	.180**	.204**	.056	.144**	.258**	.185**	.166**	.162**	.267**
CSE-WBS						.068*	.201**	.246**	.081**	.153**	.259**	.241**	.160**	.169**	.286**
CAS-AC							.145**	.379**	.308**	.064*	.096**	.075*	-.039	-.055	.050
CAS-PU								.442**	.129**	.185**	.391**	.301**	.258**	.178**	.368**
CAS-PC									.236**	.194**	.274**	.283**	.125**	.127**	.275**
CAS-BI										-.041	.026	.069*	-.030	-.049	.003
CLES-PR											.478**	.442**	.070*	.471**	.664**
CLES-NU												.517**	.399**	.424**	.787**
CLES-CV													.297**	.410**	.713**
CLES-SC														.377**	.612**
CLES-SN															.739**

$p < .05^*$ ;  $p < .01^{**}$

Table 3

*Intercorrelations of tested variables for the subsample of teachers*

	School	Work	Years	Educat.	SES	CSE-BCS	CSE-MRS	CSE-IB	CAS-AC	CAS-PU	CAS-PC	CAS-BI	CLES-PR	CLES-NU	CLES-CV	CLES-SC	CLES-SN	CLES
Gender	.013	-.226**	-.030	-.198**	-.051	.052	-.131**	-.056	-.007	.103*	-.054	-.046	.098*	.016	.046	.026	.061	.061
School		-.080	-.116**	-.001	.065	-.021	-.047	-.045	-.005	.059	.027	-.017	-.020	.031	.020	-.012	-.076	-.014
Work			-.179**	.500**	.080	.168**	.182**	.207**	.150**	.028	.140**	.152**	.065	.085	-.037	-.056	-.091*	-.006
Years				-.243**	-.129**	-.372**	-.284**	-.382**	-.326**	-.253**	-.388**	-.288**	-.165**	.020	-.024	.090*	-.019	-.019
Educat.					.134**	.185**	.178**	.200**	.162**	.153**	.200**	.172**	.116**	.065	.020	-.012	.047	.060
SES						.054	.068	.058	.016	.025	.069	.012	.070	.011	-.072	.011	-.010	.005
CSE-BCS							.463**	.493**	.431**	.409**	.532**	.527**	.277**	.169**	.289**	.139**	.230**	.277**
CSE-MRS								.780**	.298**	.266**	.520**	.342**	.128**	.155**	.098*	.104*	.151**	.165**
CSE-WBS									.370**	.320**	.529**	.400**	.205**	.167**	.135**	.081	.151**	.190**
CAS-AC										.451**	.575**	.585**	.307**	.130**	.258**	.043	.193**	.230**
CAS-PU											.480**	.543**	.359**	.260**	.318**	.186**	.284**	.357**
CAS-PC												.584**	.307**	.188**	.259**	.091*	.197**	.262**
CAS-BI													.379**	.236**	.220**	.085	.208**	.286**
CLES-PR														.560**	.473**	.379**	.517**	.748**
CLES-NU															.461**	.470**	.451**	.776**
CLES-CV																.538**	.515**	.750**
CLES-SC																	.648**	.795**
CLES-SN																		.804**

$p < .05^*$ ;  $p < .01^{**}$

Table 4  
*Predictors of constructivist teaching: teachers and students*

Predictors	Teachers				Students			
	<i>R</i>	<i>R</i> <sup>2</sup>	$\Delta R^2$	$\beta$	<i>R</i>	<i>R</i> <sup>2</sup>	$\Delta R^2$	$\beta$
Step 1	.106	.011	.011		.159	.025	.025**	
Gender (teachers and students)				.073				-.002
Place of school (teachers and students)				-.021				-.039
Work place (teachers) / Grade (students)				-.037				.147**
Years of service (teachers)				-.006				
Education (teachers)				.094				
SES (teachers)				.001				
Step 2	.318	.101	.090**		.324	.105	.080**	
Gender (teachers and students)				.056				.005
Place of school (teachers and students)				.003				-.002
Work place (teachers) / Grade (students)				-.069				.086**
Years of service (teachers)				.125*				
Education (teachers)				.068				
SES (teachers)				.000				
CSE – Basic Computer Skills				.271**				.140**
CSE – Media-Related Skills				.002				.054
CSE – Web-Based Skills				.104				.145**
Step 3	.423	.179	.078**		.467	.218	.113**	
Gender (teachers and students)				.039				-.008
Place of school (teachers and students)				-.013				-.011
Work place (teachers) / Grade (students)				-.042				.061*
Years of service (teachers)				.156**				
Education (teachers)				.031				
SES (teachers)				.007				
CSE – Basic Computer Skills				.143**				.074
CSE – Media-Related Skills				-.011				.059
CSE – Web-Based Skills				.042				.101*
CAS – Affective				.023				-.061
CAS – Perceived Usefulness				.252**				.308**
CAS – Perceived Control				.060				.103**
CAS – Behavioural Intent				.065				-.069*
Step 4	.436	.190	.011		.467	.235	.017**	
Gender (teachers and students)				.046				.002
Place of school (teachers and students)				-.015				-.010
Work place (teachers) / Grade (students)				-.037				.062*
Years of service (teachers)				.150**				
Education (teachers)				.034				
SES (teachers)				.003				
CSE – Basic Computer Skills				.150**				.077*
CSE – Media-Related Skills				-.021				.050
CSE – Web-Based Skills				.028				.092*
CAS – Affective				.040				-.051
CAS – Perceived Usefulness				.235**				.289**
CAS – Perceived Control				.054				.098**
CAS – Behavioural Intent				.057				-.076**
Computer				-.059				.007
Internet				.052				.061
Mobile phone				.015				-.049
Multimedia software				.058				.090*
Tablet computer				-.013				.013
Smartphone				-.030				-.003
Social networks				.079				.022
N			502				1026	

$p < .05^*$ ;  $p < .01^{**}$

In the case of students (Table 4), the first step includes sociodemographic characteristics which are alone significant for constructivist learning ( $F(3, 1021)=8.78$ ;  $p<.01$ ) and account for a total of 2.5% of the variance. The second step includes computer self-efficacy, which significantly raises the variance by 8% ( $F$  change (3, 1018)=30.32;  $p<.01$ ), and along with the previous factors significantly accounts for 10.5% of the total variance ( $F(6, 1018)=19.93$ ;  $p<.01$ ). The third step includes attitudes towards new media, which significantly raises the variance by 11.3% ( $F$  change (4, 1014)=36.67;  $p<.01$ ) and along with the previous factors account for a total of 21.8% of the variance of constructivist learning ( $F(10, 1014)=28.3$ ;  $p<.01$ ). The last step includes the frequency of using new media which is significant and raises the variance by 1.7% ( $F$  change (7, 1007)=3.13;  $p<.01$ ) to a total and significant variance of the explanation of constructivist teaching of 23.5% ( $F(17, 1007)=1818$ ;  $p<.01$ ). The final model shows that certain factors are particularly significant. Those students who have a higher final score from the previous grade, those who express a higher level of computer self-efficacy (basic computer skills and web-based skills), the students who have positive attitudes towards Perceived Usefulness and Perceived Control, but reduced Behavioural Intent and those students who more frequently use multimedia software are more inclined towards constructivist learning (with new media).

In the case of teachers (Table 4), the first step includes sociodemographic characteristics which alone are not significant for constructivist learning ( $F(6, 493)=.92$ ;  $p>.05$ ) and account for a total of 1.1% of the variance. The second step includes computer self-efficacy, which significantly raises the variance by 9% ( $F$  change (3, 490)=16.3;  $p<.01$ ), and along with the previous factors significantly accounts for 10.1% of the total variance ( $F(9, 490)=6.11$ ;  $p<.01$ ). In the third step, there are attitudes towards new media that significantly account for 7.8% of the variance ( $F$  change (4, 486)=11.54;  $p<.01$ ) and along with the previous factors account for a total of 17.9% of the variance of constructivist learning ( $F(13, 486)=6.15$ ;  $p<.01$ ). The last step includes the frequency of using new media which is not significant and raises the variance by 1.1% ( $F$  change (7, 479)=3.13;  $p>.05$ ) to a total and significant variance of the explanation of constructivist teaching of 19% ( $F(20, 479)=5.62$ ;  $p>.01$ ). The final model shows that those teachers who have more years of service, those who express a higher level of computer self-efficacy (basic computer skills), and teachers who have positive attitudes towards Perceived Usefulness are more inclined towards constructivist learning (with new media).

## Discussion

Considering that a large percentage of both students and teachers own a computer, have access to the internet and a personal computer, and that 90% of the students have their own profile on one of the social networks, which is in line with the trend also observed by Rideout et al. (2010), it is possible to make everyday events in school more diverse with new content and teaching scenarios to satisfy the development needs and

styles of learning of the net generation more fully than through traditional didactic solutions, as confirmed by certain studies (Schaumburg & Issing, 2002; Schaumburg, 2003). On the other hand, although a large number of students own a smartphone, there is very little learning related to this modern gadget in the classroom, and it is also insufficiently used as a learning tool.

Most teachers never use tablet computers, smartphones and social networks in the teaching process. Although most teachers are computer literate, since the Ministry of Education has organised free training for all teachers, it remains to be seen why teachers, despite their digital competence and the fact that both the school and the students at home have quite a lot of digital equipment, continue to organise teaching scenarios exclusively by relying on traditional media and traditional teaching scenarios. However, it is interesting to note that students assess their use of certain new media (tablet computers, smartphones and social networks) more frequently in the classroom than assessed by the teachers, which is explained by the further results of this study on computer self-efficacy.

Students in general have a higher level of computer self-efficacy than teachers, which only confirms the results of Whitley's meta-analysis (1997). In view of certain factors of computer self-efficacy, it can be seen that teachers have a higher level of self-efficacy in Basic Computer Skills, which can be explained in the sense that these skills are something "normal" to students, while teachers find them a little more significant, thus confirming that they are digital immigrants (Prensky, 2001). On the other hand, students have a higher level of self-efficacy in Media-Related Skills and Web-Based Skills, because students satisfy part of their social and self-actualisation needs via new media (Ito et al., 2010), especially social networks based on Web 2.0 technology, where such skills are exactly what is needed.

Furthermore, teachers have more positive attitudes towards new media in general, but also in certain attitude dimensions, except in their attitudes towards Perceived Control where both subgroups have similar attitudes. That is, students have neutral attitudes, while the teachers have positive ones. This can be explained in the sense that teachers are still quite euphoric in terms of new media, while students, as persons who use them extremely frequently and competently, do not regard them as "special" and "euphoric".

It is interesting to note that teachers, who have more positive attitudes, but a lower level of computer self-efficacy, use new media in the classroom less frequently, whereas the students, who have more negative attitudes, but a substantially higher level of computer self-efficacy, use them more frequently. This can be explained by the fact that teachers assess their self-efficacy as higher in Basic Computer Skills (PPT, basic computer software, etc.), which are mainly needed only for using the media in frontal instruction, while Web 2.0 skills, which is exactly what students possess, are needed for student-based instruction.

Teachers, in general, assess their use of constructivist teaching frequently, in all of its dimensions, while students assess that it is organised occasionally. This can be

interpreted in the sense that most teachers received training in traditional teacher-centred didactics in the course of their pre-service education (see average of, and the span of years of service), so they are likely to label various elements of instruction which are not student-centred as student-centred instruction. This can be supported in a way that students, as the main subjects of instruction, do not view instruction that is viewed as constructivist by the teachers as such, since it does not satisfy their needs.

Although one could say that constructivist teaching is organised occasionally, further analyses show certain correlations. In the case of teachers, sociodemographic characteristics and the use of new media are not significant as predictors of constructivist teaching, but computer self-efficacy and attitudes towards the new media are significant. In the case of students, sociodemographic characteristics, computer self-efficacy and attitudes towards new media and the use of new media are significant. However, what is significant is that computer self-efficacy and attitudes towards new media are what is most significant (and they account for a variance that is almost the same as for the teachers), and not the use of the new media in teaching. The results are, to a certain extent, in line with previous studies that show that self-efficacy and attitudes are extremely important for teaching (Johnson, 2005; Larbi-Apau & Moseley, 2012; Shapka & Ferrari, 2001), i.e., that such factors are more significant for student-centred instruction with new media than the use itself of new media in teaching (Dillon & Gabbard, 1998; Tamim et al., 2011).

## **Conclusion**

The research confirms previous theoretical explanations (Dillon & Gabbard, 1998; Tamim et al., 2011) that new media alone are not significant for the quality of learning and teaching. Other factors are significant, such as the individual characteristics of students and teachers, motivation, the ability to use the new media, the goals of instruction, its content, and one of the most significant ones is the didactic arrangement that includes the use of new media. Therefore, new media in teaching should be viewed as part of didactic strategies for student-centred instruction. Almost all students and teachers own a computer, mobile phone, have access to the internet and have some sort of multimedia software, while to a lesser extent they own a tablet computer and smartphones. Students have profiles on social networks significantly more than teachers. Thus, they are confirmed as the net-generation. Despite such extensive possession of the media, it is rarely used in teaching, where students express they use it more frequently than expressed by teachers who prepare the instruction. Students express a higher level of computer self-efficacy than teachers do. Teachers have somewhat more positive attitudes towards new media than students, which shows that students view new media not as something “special”, but as something “common”. Constructivist teaching is organised occasionally, given that the students express that it is organised occasionally, although teachers assess that it is organised frequently. Both in the case of students and teachers, it is not the use of new media that is significant

for constructivist teaching with new media, but their attitudes towards media and computer self-efficacy, which confirms certain previous theoretical presumptions (Dillon & Gabbard, 1998; Tamim et al., 2011). It is justified to believe that modern teaching does not satisfy the needs of present-day students who demand student-centred instruction that is organised, among other things, with the use of new media. The results imply that teachers must undergo training to prepare student-centred instruction with the use of new media, i.e., to teach media and constructivist didactics.

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# Neki prediktori konstruktivističke nastave u osnovnom obrazovanju

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## Sažetak

Cilj istraživanja bio je ispitati u kojoj se mjeri pojedina sociodemografska obilježja učenika i učitelja, zajedno s računalnom samodjelotvornošću, stavovima prema novim medijima i učestalošću korištenja novih medija u nastavi mogu smatrati prediktorima konstruktivističke nastave. Istraživanje je provedeno na uzorku skupina ( $N = 1528$ ) učenika osmih razreda ( $N=1026$ ) i učitelja razredne i predmetne nastave ( $N = 502$ ) u osnovnoj školi. Podatci su prikupljeni preuzetim instrumentima Skale računalne samodjelotvornosti, Skale stavova o novim medijima, Skale konstruktivističke nastave i konstruiranom Skalom učestalosti korištenja novih medija u nastavi. Rezultati ukazuju na to da su kod učenika sociodemografski podatci, viša razina računalne samodjelotvornosti, pozitivniji stavovi prema novim medijima i učestalije korištenje, kao zasebni čimbenici, značajni prediktori konstruktivističkog učenja. Kod učitelja su značajni stavovi i računalna samodjelotvornost, ali ne i sociodemografska obilježja te korištenje novih medija. Cjelokupna završna serija, i kod učitelja i kod učenika, značajan je prediktor konstruktivističkog učenja, s tim da su pojedine zasebne dimenzije prediktorskih čimbenika značajnije od drugih. Veću varijancu konstruktivističke nastave, i kod učenika i kod učitelja, objašnjavaju stavovi o novim medijima i računalna samodjelotvornost nego sama upotreba novih medija u nastavi, što potvrđuje neke prijašnje teorijske pretpostavke. Iako su dobivene značajne korelacije, rezultati ukazuju na povremeno organiziranje konstruktivističke nastave. Za razliku od učitelja učenici smatraju nove medije značajnim za konstruktivističko učenje, čime se potvrđuju kao pripadnici net-generacije. U radu su objašnjeni mogući razlozi i implikacije takvih rezultata.

**Ključne riječi:** konstruktivizam; novi mediji; osnovna škola; računalna samodjelotvornost; stavovi o novim medijima.